

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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The Scientific Prosecution of War

A FEW months ago twenty-five "scientists"—their names are not recorded—met round a dinner table. The world was falling about their heads, the armed resistance of France had collapsed; but it was a typically English rendezvous; Douglas Jerrold has reminded us that if an earthquake were to engulf England tomorrow, the English would contrive to meet and dine somewhere among the rubbish—to celebrate the event. So, having dined, the five-and-twenty scientists, like common mortals, proceeded to set the world to rights. The result of their discussion has been embodied in an eminently readable little volume issued in the Penguin series under the title: "Science in War."

Most of our readers have no doubt had the advantage of reading this book and it is not, therefore, necessary to do more than remind ourselves that its anonymous authors urge powerfully that in peace, and above all in war, there should be a scientific approach to our problems, and that only by utilising science to the full can we hope to meet the great forces arrayed against us. Some of the triumphs of Science are recalled: the artificial production of dyes, the fixation of atmospheric nitrogen with its untold possibilities in agriculture and in the production of explosives, the artificial production of petrol, of silk, and now of wood-sugar, the vast advances in metallurgical knowledge, both ferrous and non-ferrous, the degaussing of ships to deal with the magnetic mine, the control of disease and infection in times of peace and among the armies in the field, and the development of the aeroplane. It is an impressive recital, and still the half is not told unto us. It is claimed that the rulers of the people, and in particular the high officials in the Services and in the Civil Service, are unwilling, in spite of all these triumphs, to enlist the aid of science in dealing with the fundamental problems of the hour. If half of what the authors aver is true, it is a damning indictment, and one which should be marked by those in authority.

"In dealing with new problems," the authors declare, "there is little disposition to initiate and carry out high-speed research." The reason for this, in so far as it is true, is twofold, in our opinion. It is a real defect in our system that men do not rise to high administrative position in the service of the State until they are too old to accept new ideas readily; by that time their whole training and experience is on the side of conservatism. We make Flight-Lieutenants of the young and quick-thinking. We make Generals

of the old and cautious. To handle the new weapons we require the young with receptive minds. It is just that type of mind that would welcome the new weapon of Scientific Research, whereas the older, conservative mind rejects it. The second reason is that scientific research may be slow in its reactions. In times of peace we never weary of warning the business man that while scientific research is his most important weapon, he must not expect quick results from it. In war, one cannot wait for the slow workings of scientific research. Perhaps the ideal method is that which was practised by an old works manager in the days of our youth. On receiving a report that undue quantities of a product were escaping with the waste liquor, he called a chemist to take samples and to diagnose the trouble; then he adjusted the plant according to his own intuition and on the basis of practical indications that his experience had taught him. He had the chemist's analyses some hours later to tell what should have been done; but in the meantime he had taken steps which more often than not had already cured the trouble. So might we proceed in war.

In spite of the indictment contained in this book, and of the very many obvious and disturbing truths that it contains we are not altogether sure, *pace* the twenty-five scientists "all of whom speak with authority in their own fields," that the book is quite fair to the authorities. It is known that many research groups are actively at work on the problems thrown up by the war. For obvious reasons the results of their work are shrouded in mystery, but the history of the magnetic mine shows that the authorities employ scientific minds when the need arises. A good many pages are devoted to the inefficiency of our tank-fighting methods and to the valuable information that scientific research might afford to the military authorities; but are the writers quite sure that what they advocate has not already been done, though possibly not on exactly the lines that they suggest?

The importance of scientific management is stressed, and no doubt at the time the book was written it appeared as though the authorities were ignorant of the need for resting the workman and for applying the many lessons now known as the A.B.C. of scientific management; but later events suggest that the authorities have not been as blind to these fundamentals as the writers would have us believe. Nevertheless, there remains the fact that there are all too many men in high authority who do not understand Science and its powers, nor appreciate the aid of the scientific man.

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NOTES AND COMMENTS

Toluol and War-Time Prices

THE probable need for emergency supplies of toluol for high explosive manufacture has directed the attention of American petroleum refiners towards the possibility of developing methods of toluol production which normally cannot compete with the coke-oven system. Only a war-time demand could raise the price of toluol to the point where petroleum processes could compete. In 1917-18 the United States found themselves faced with an acute shortage of toluol for TNT manufacture; their total supply in 1916—some four million gallons in all—was derived from by-product coke plants, according to figures reproduced in the August issue of *Chemical and Metallurgical Engineering*. In 1917 and 1918, however, U.S. production of toluol rose to totals of ten million and 14 million gallons, respectively, of which $2\frac{1}{2}$ and $4\frac{3}{4}$ million gallons originated from non-coke-oven sources. Since the end of the last war, of course, many new peace-time uses for toluol have come into being, and the average normal requirement of the U.S. is from 15 to 17 million gallons per annum. U.S. war-time requirements have been estimated at some 37 million gallons per annum, and most of that would have to come from petroleum refineries, which, it is reckoned, could compete with coke-oven toluol at a price of 45 cents per gallon. Elsewhere in this issue some indication will be found of the steps that American industrialists are contemplating in the event of a largely increased demand for toluol.

Winter Courses in Chemistry

POST-GRADUATE courses of instruction in chemistry are to be given during the winter months at Liverpool, Manchester and Widnes. At Liverpool, in addition to the ordinary post-graduate courses which prepare for the Honours B.Sc., for the A.I.C. and the F.I.C., in "Oils and Fats" there will be offered a course of ten lectures on "Water," ten lectures on "Recent Advances in Nutrition and twenty-five lectures on "The Synthesis and Properties of Some of the More Recently Prepared Synthetic and Naturally Occurring Organic Compounds." This will embrace consideration of sulph-anilamide chemotherapeutics; open-chain organic nitrogen compounds; some recently-investigated alkaloids; phthalocyanine pigments; plant hormones; amino acids; the cyclol hypothesis; the chemistry of antigen-antibody reactions; crystalline enzymes; and carotenoid

pigments. The course on chemical engineering will be conducted by Dr. J. R. Brown and Mr. E. Woollatt. The Manchester syllabus embraces: "Application of X-ray Methods to the Study of Metals"; "Chemical Microscopy and Qualitative Inorganic Analysis by Drop Reactions"; "Chemotherapy"; "Latex Technology"; "Modern Developments in Colour Chemistry"; and "Mechanism of Reactions."

Bones as Salvage

ONE hundredweight of bone per thousand of the population per month is the figure that the Ministry of Supply has set as a standard for councils in the salvage drive; and of the three main categories of scrap which are being collected for salvage—scrap metal, waste paper, and bones—the last would appear to be the slowest to attain the desired figure. The number of individual councils that are returning the desired 1 cwt. per 1000 per month is increasing, but so far not one of the six groups of local authorities has reached the requisite average overall. The six groups are: Scotland, the English County Boroughs, other Boroughs, Urban Districts, London, and the Rural Districts. So far Scotland holds the lead, and the others take rank in the order stated; and Scotland hopes to be the first to reach the Ministry average in the "bone drive," as it is well ahead of the average in paper and metal. Of the three items bone is the one that most nearly interests the chemical industry. The material of bone consists essentially of 28 per cent. ossein, which yields gelatine and is employed in the preparation of glue; 64 per cent. calcium and magnesium salts, including 56 per cent. calcium phosphate, 8 per cent. calcium carbonate, and 1 per cent. each of calcium fluoride and magnesium phosphate; and 6 per cent. fat. The last yields stearic acid, palmitic acid, oleic acid, and glycerol. The phosphates find a well-known use as manures, while the carbonate is the principal constituent of bone-black or bone-char, with its adsorptive properties.

Polyvinyl Chloride Research

Solvents for Highly Chlorinated Grades

GRADES of polyvinyl chloride with relatively high softening points are particularly interesting for the manufacture of films and textile fibres (e.g., the German PeCe fibre). These grades contain as a rule more than 65 per cent. chlorine, since the low softening temperature (below 100° C.) of less highly chlorinated resins is an obvious disadvantage. Unfortunately, the highly chlorinated grades suffer from the drawback of practical insolubility in common solvents normally used in making solutions for film casting or textile spinning.

An interesting new solvent which is stated (Ital. P. 374,744, of the I.G.) to form highly satisfactory polyvinyl chloride solutions is tetrahydrofuran. This is a cyclic solvent of the ether type with a structural resemblance to dioxan. with a boiling point of 65° C., it is slightly less volatile than acetone, and differs from both dioxan and acetone in being only slightly soluble in water. According to the I.G. patent, spinning solutions are prepared from a polyvinyl chloride with softening point of 115° C. (Martens test) by stirring at 50° C. with a mixture of 65 parts tetrahydrofuran and 5 parts acetone to form a 25-30 per cent. solution.

Furan can be made from furfural or some of its derivatives and then hydrogenated to tetrahydrofuran in good yields. Indirect methods of manufacture have also been developed in recent years, of particular interest being the formation by reduction of butyl succinate (U.S.P. 2,130,501) or by dehydration of 1,4-butylene glycol (E.P. 508,548).

Petroleum Toluol for National Defence*

American Sources of Supply

PRODUCTION of high-grade toluol was a major problem of the American ordnance department on the entry of the United States into war in 1917. Before then, the by-product coke-oven was the sole source of toluol in America, and it was not until November, 1917, that construction work began on plants for stripping toluol from domestic gas; and shortly before the armistice a third source of toluol was tapped—the hydrocarbons of petroleum.

To-day, the situation is vastly different. The problem is again large, but the only important questions to decide are those which relate to minimum cost and maximum industrial convenience. It is, however, obvious that a secondary source of supply must be provided to supplement the coke ovens. Undoubtedly this secondary source will be the petroleum industry. Thanks to many years of research, the industry is ready with several processes. Investigations have latterly been more often aimed at producing aromatics for blending in high-octane motor fuels, but the results are applicable in the present demand for toluol. As pointed out by Cooke, Wagner and Swanson, aromatic solvents (with toluol content of as much as 50 per cent.) are now produced from high-aromatic crudes. But TNT requires a toluol of 99 per cent. purity.

The oldest method of obtaining toluol from petroleum consists of fractionation—generally followed by chemical or physical extraction—of certain crudes. A cut of relatively narrow boiling range containing the toluol (b.p. 110.8° C.) is taken from the crude. Subsequently, a high degree of fractionation or extraction with some such solvent as liquid SO₂, or a combination of fractionation and extraction, yields toluol of the required purity. This process is of limited application. The production of crudes containing appreciable quantities of toluol is quite limited and no comprehensive study of American crudes with respect to toluol content is available. However, it is probable that some of the crudes of California and Arkansas are the best.

Rittman Cracking Process

It is obvious, however, that means are needed for securing toluol in greater amount than that present in a few high-aromatic crudes. One promising method is that for which the groundwork was laid during the last war—low-pressure, high-temperature cracking of petroleum oils. There is some evidence that the characteristics of the oils do not play as vital a part in the yields of toluene as do the conditions under which cracking is carried out. Rittman and his collaborators reached this conclusion after choosing three oils as being representative of paraffin, mixed-base and asphaltic crudes. These were cracked at temperatures from 500° to 850° C. and pressures from sub-atmospheric to 24 atm. Results of these experiments showed that for commercial work temperatures from 620° to 700° C. and pressures upward of 8 atm. were most suitable. A plant was built in 1915 by the Aetna Explosives Co. at Pittsburgh to make toluol by the Rittman process. However, considerable difficulty was encountered—principally with the condensers, which permitted large quantities of toluol to escape with the gases. Cracking was done in the vapour state in vertical steel tubes, which were inclined to coke up and become troublesome.

More recently Sachanen, writing of low-pressure, high-temperature cracking, declared, "The formation of aromatic hydrocarbons in this process at 650° C. and higher, is mostly due to the secondary reactions of cyclisation and condensation of olefines. It explains why the yields of benzene hydrocarbons under these conditions are almost independent of the nature of charging stocks, in contradistinction to the customary practice at more moderate temperatures." Not all researchers, however, share this viewpoint, some contending that yields are dependent on the nature of the charging stock.

Groll reported from the laboratories of the Shell Development Co. in 1933 the results of cracking a paraffinic gas oil of 38° A.P.I. gravity and 275°-420° C. boiling range. In a single-pass operation (laboratory scale) using a non-catalytic cracking tube at atmospheric pressure and heated to 750° and 800° C. the respective yields of toluol were 1.73 and 1.49 gal. per bbl. of charge. The Sarmiza process produces aromatics by vaporisation of a petroleum oil and aromatisation of the vapours by subsequent heating in three stages, during which olefines produced in the cracking reaction are polymerised to cyclic compounds which are then dehydrogenated to aromatics. When a light oil of 43.4° A.P.I. gravity and 155° to 280° C. boiling range and vaporised and heated at atmospheric pressure successively at 500°, 600° and 722° C. a yield of toluol amounting to 8.4 weight per cent. of the charge was obtained. Precisely what amount of this product was actually made in the process is uncertain, since the charge itself contained 13.99 per cent. total aromatics.

Gas Pyrolysis

A third means of producing toluol exists in the thermal pyrolysis of hydrocarbon gases from petroleum such as natural gas and the cracked gases made in refineries as by-products. As in the cracking of liquid feed stocks, the reactions of the process are complex and result in considerable amounts of olefines and aromatics. Ridgway, Wagner and Swanson (Pure Oil and Alco) reported in 1936 in an account of some semi-commercial operations that when a refinery gas mixture containing 35.1 volume per cent. unsaturates was pyrolysed at a pressure of 61 lb. sq. in. and a temperature of 625° C., a yield of 2.07 gal. of 205° C. end point aromatic distillate per 1000 cu. ft. of gas was secured. The toluol found in this distillate and in a heavier liquid product amounted to over 0.26 gal. per 1000 cu. ft. of gas charged. The previously mentioned report of Groll also contained results of some laboratory work on the pyrolysis of individual hydrocarbon gases ranging from ethylene to butane. Under the conditions employed the highest yield of toluol was from propylene. At atmospheric pressure and a temperature of 800° C., propylene gave a yield of 0.46 gal. per 1000 cu. ft. The lowest yield, obtained under the same conditions, was from ethylene, which gave 0.23 gal. of toluol per 1000 cu. ft.

The Heptane Process

The production of toluol by the catalytic aromatisation of *n*-heptane is another process which is receiving consideration. Von Grosse, Morrell and Mattox recently described some results from this process obtained in the laboratories of the Universal Oils Products Co. When *n*-heptane was passed at atmospheric pressure through a tube containing chromic oxide and alumina catalyst and heated to 550° C. at a space velocity of 0.385 vol. per vol. per hour, a single-pass yield of about 66.0 weight per cent. of toluol was obtained. The mechanism of the reaction was explained as one of successive dehydrogenation. The loss of one atom of hydrogen from each end of a molecule of heptane resulted in the formation of a molecule of methylcyclohexane, and the loss of six atoms of hydrogen from this molecule produced a molecule of toluene. Goldwasser and Taylor have also produced toluol by the catalytic aromatisation of *n*-heptane in the laboratory. Using chromic oxide gel as a catalyst, and employing a temperature of 460° C. they passed *n*-heptane over the catalyst at various feed rates. The conversion of this material to toluol varied from 60 to 100 per cent. in a single-pass operation, they stated.

Unfortunately, but little information on the production of aromatics by catalytic reforming (cracking) of petroleum naphthas is available, this process being relatively new.

(Continued on page 124.)

* Adapted from Chem. and Met. Eng. 1940, 47, 8, 535-7.

British Association of Chemists

Unemployment Insurance Act, 1940

WHAT will the aftermath of war hold in store for chemists? Will it bring depression and unemployment. The British Association of Chemists is an association admirably adapted to help the individual chemists in prosperity and adversity. It specialises in the economic interest of the chemist. In prosperity the Unemployment Fund builds up a reserve. In adversity the chemist has a call on the reserve of over £21,000 as an insurance against unemployment.

The Unemployment Fund, the only one of its kind for a profession, was started in 1922. After a successful period of operation the rules have recently been revised, whereby members obtain certain extra benefits which should be of great service to all chemists, but which are probably not yet widely known. The original unemployment scheme was unable to include the unqualified chemist or probationer, and he was left to obtain the usual unemployment benefit from the Labour Exchange. When the new rules were under consideration, the U.B.F. Committee was anxious to include these young members in the scheme. An arrangement has recently been concluded with the appropriate Government Department whereby all members who received national unemployment insurance may do so through the head office of the British Association of Chemists, and it will only be necessary to attend the Labour Exchange to "sign on" approximately once a week. This applies only to such probationers who elect to become "Junior Associates" and join their special section of the British Association of Chemists' Unemployment Scheme. Their subscription, which will include the subscription to the general fund of the British Association of Chemists, is 2s. 6d. per month or 30s. per annum, payable in advance. For this they will have certain valuable and definite advantages:—

- (1) The use of the British Association of Chemists' Appointments Service. Only those who have to hunt for a job know what use this can be.
- (2) Their national unemployment benefit sent to them from head office with an additional 3s. per week. On promotion to full member they will become eligible for benefit on one unit after three months' contributions have been paid.

The Rising Young Chemist

Let us suppose that the young chemist has become a full member, but is for a short period to receive less than £420 per annum. Arrangements made with the appropriate Government department still allow the British Association of Chemists to pay his insurance monies in addition to the monies he is due to draw as a full member. The responsibilities of this young chemist as a member of the profession will now have increased and so will his expenses. He will now be expected to pay £1 1s. a year to the general fund and £1 10s. a year for one unit. This unit will produce (in addition to the Government monies), 3s. a week for the first three weeks, 8s. 6d. for the fourth week, and 17s. 6d. a week subsequently for 25 weeks.

In due course the young chemist leaves the Government Unemployment Scheme behind as his salary increases. He now considers that the time has come to increase his holding in the British Association of Chemists' Unemployment Benefit Fund. He may take up to four units, which would yield £3 10s. per week. Each unit costs 30s. per annum. The British Association of Chemists' Unemployment Scheme is run on the "unit" system, and members at their option may take out a maximum of three units over and above the compulsory one unit (the fund shows an average of between two and three units per member). The scale of benefit is graded and decreases at age of entry when this is over 40.

To those members who are fortunate enough never to need the help of the fund a repayment is made at retirement or age 65. The present rate is one-fifth of the monies paid in, less any benefits drawn

Making Paper Moisture-proof

New I.C.I. Packaging Product

A NEW material called W. 535 is announced by Imperial Chemical Industries as a contribution to solving a war-time problem—that of providing moisture-proof packaging for foods, medicinal powders, etc., despite the shortage of tinplate and paper pulp. The many uses for W. 535 include the coating of paper—even of relatively inferior war-time quality—for making moisture-proof containers. In carton manufacture, the paper can be fastened to the baseboard with W. 535, thus providing a container that is automatically moisture-proofed. Chipboard containers, if coated or interlined with W. 535, give their contents as much protection from moisture and atmospheric contamination as the heavier boxes, with extra wrappings, previously used. Considerable savings in pulp are thus made possible. Containers incorporating W. 535 will also have additional usefulness in view of the recent restrictions on the use of tins. Even aluminium foil can be replaced by paper coated with the new material.

Non-Cracking Film

The film provided by W. 535, in addition to its moisture-proofing and adhesive features, is flexible and non-cracking, and offers considerable resistance to chemical action and oily materials. It is moreover, colourless and odourless.

Although paraffin wax has previously been widely used for coating paper, a serious weakness of a wax coating is that it readily cracks when the paper is folded and "white" cracks can be seen even by the naked eye. Moisture passes very readily through these cracks. The superiority of W. 535 over paraffin wax has a physical explanation. While both are crystalline, the crystals and voids of the paraffin wax are much larger than those of W. 535. The new material has thus a lesser permeability to moisture and greater flexibility. Although for the highest grades of container W. 535 will be used alone for coating, it can also be used to improve paraffin wax because the crystal size of the wax is reduced even when the ratio of the paraffin wax to W. 535 is as high as 6 to 1. Satisfactory moisture-proofing can be obtained from mixtures of W. 535 and paraffin wax with a very much thinner film than with paraffin wax alone. The coating, when a mixture is used, is non-flaking, relatively flexible, and does not readily penetrate the paper during cooling as is the case with paraffin wax alone. The mixture, like paraffin wax, is applied hot, but sets more quickly than wax alone.

A mixture of W. 535 and paraffin wax, provided the proportions are suitably adjusted, can be used as a moisture-proofing material in the manufacture of parchfoil, for combining two papers, or for combining chipboard and paper in paper box and carton manufacture. It can also be used for dipping cartons for liquids to render them waterproof, whilst composite containers can be moisture-proofed with the mixture during manufacture.

Method of Application

Whether used alone or with paraffin wax, W. 535 can be applied to paper by a standard waxing or pitch-lining machine with only minor adjustments. The best type of machine consists essentially of a coating roller with a scraper or Doctor knife a scraper to remove the excess put on by the coating roller and, if combining is to be done, a set of pressure rollers. The temperature of working is 93-104°C., and local overheating should be avoided. The angle of approach and the tension of the paper as it passes over the scraper after leaving the coating roller regulate the thickness of the film. Combining rollers should be as near the scraper as possible, adhesion between coated and uncoated paper depending upon quick contact and instant cooling after coating.

The addition of W. 535 to paraffin wax slightly raises the working temperature required for paraffin wax alone. The addition is made by stirring the paraffin wax and W. 535 together at about 93°C. When kept at this temperature for a few hours, the two materials form a homogeneous mixture.

Petroleum Chemistry Symposium

Meeting of the American Chemical Society

BY courtesy of the American Chemical Society we are able to publish some abstracts of the papers presented at the meeting of the Division of Petroleum Chemistry, at Detroit, Michigan, on September 9 to 13. The first section deals with the contribution of Petroleum Chemistry to the Automotive Industry.

R. R. Thurston and E. C. Knowles, of the Texas Company, presented a paper entitled "Oxidation of asphalt and its constituents at service temperatures." Under weathering conditions, the authors point out, asphalt surfaces undergo oxidation. This photo-oxidation property of asphalt and its constituents has been studied by exposing samples in oxygen-filled sealed Pyrex containers under a sun-lamp at temperatures approximating 77° C. The constituents, identified as asphaltenes, resins, naphthene oil, paraffin oil and wax, were obtained from three typical petroleum residues. All constituents absorbed oxygen, the resin and naphthene oil being slightly more readily oxidised. Part of used oxygen was eliminated as water and carbon dioxide, and all residues showed weight increase.

"Future needs in fuel and oil for motor transport" was the title of a paper by T. A. Boyd, of General Motors Corp., Detroit, who pointed out that chemistry offers the chief assurance that the first need of the future for motor transport, a plentiful supply of oil and liquid fuel, will be met. This assurance comes out of all the chemist and the chemical engineer are doing to help find petroleum, to get the maximum amount of oil out of the sand, to refine each barrel of petroleum to best advantage, to utilise fuel and oil efficiently, and also to make coal, oil shale, and vegetation available as reserves for the future. The principal prospect of a further major improvement appears to be in degree of freedom from knock. And freedom from knock depends, of course, upon the chemical constitution of the fuel components. The use of Diesel fuels in automotive vehicles is still too new to point future directions with complete clarity, but the principal improvement will perhaps be in ignition quality. In respect to lubrication, some of the major needs for the future are still better and more stable lubricants and better means of telling whether an oil is good enough for any given service. And this seems to call for a more fundamental understanding of the chemistry and the physics of lubrication.

Octane Rating

Speaking on "Octane rating relationships of aliphatic, alicyclic, mononuclear aromatic hydrocarbons, alcohols and ketones," Gustav Egloff and P. M. Van Arsdell, of Universal Oil Products Company, Chicago, showed that no single standardised motor test method evaluates the non-detonating properties of organic substances in an automobile engine. A correlation of structure with octane rating has been attempted under research and motor method conditions using pure aliphatics, alicyclics, alcohols and ketones, and a blend of mononuclear aromatics. This study indicates, in part, that for all groups the longer the straight chain part of the molecule, the lower the octane rating. The tertiary carbon atom also seems to have considerable influence on the non-detonating quality of the hydrocarbon and may be roughly correlated with the influence of the olefine double bond, since, as both converge on the centre of the molecule, the octane rating is raised. A quaternary carbon is oriented near one end of a paraffin chain also has a great effect in increasing the non-detonating characteristics.

R. E. Tannich, B. W. Thomas, and A. R. Padgett, Humble Oil and Refining Company, Baytown, Texas, gave details of a study on "The composition of some cracked and polymerised naphthas." Three samples of refinery cracked naphthas, representing the products of thermal cracking and polymerisation on processes, were analysed with the aid of a 115-plate batch laboratory column. The unsaturated con-

tents of representative fractions of these naphthas and the quantities of certain paraffins and naphthenes present have been determined. The concentration of unsaturates is shown to be greatest at split points between saturated compounds and in general to decrease with increasing boiling point of the cracked naphtha. The gasoline produced by thermal polymerisation of propane and butanes shows a higher degree of unsaturation than does that produced by thermal cracking of heavy petroleum fractions such as gas oils and residues.

Ignition of Hydrocarbons

Charles W. Sortman, Harold A. Beatty, and S. D. Heron, Research Laboratories, Ethyl Gasoline Corp., dealt with "The spontaneous ignition of hydrocarbons and the zones of non-ignition." Spontaneous ignition temperatures in air, and the corresponding time lags, have been determined for a variety of hydrocarbons at atmospheric pressure by the oil-drop or Moore method, using a steel crucible and different air flow rates and liquid drop sizes. Under some conditions of air and liquid feed, the readily-ignited hydrocarbons, such as cetane and heptane, show distinctly two separate temperature zones of non-ignition, above the minimum ignition temperature, a behaviour heretofore unobserved; under other conditions, one or both of these zones are eliminated. The conditions of air and liquid feed also have a marked effect on the ignition time lag, especially at low temperatures. Addition of tetraethyl lead completely inhibits ignition up to about 450 to 540° C.

M. R. Fenske and R. E. Herch, The Pennsylvania State College, found that the systematic separation of a lubricating oil distillate by selective solvent extraction and fractional distillation into portions comprising 0.6 to 1.4 weight per cent. of the original oil allowed the construction of three-dimensional diagrams incorporating yield, viscosity index and molecular weight or viscosity. Such diagrams permit an estimation of the distribution of oil fractions with respect to molecular size and molecular type. Used in connection with graphs of boiling point and aniline point isotherms superimposed on the composition diagram, methods for the segregation of any portion of the oil are suggested. Comparison of the physical properties of the fractions with those of synthetic hydrocarbons indicates that the oil fractions, while perhaps far from being separated into pure compounds, are segregated into groups ranging from monocyclic naphthenes ($C_{10}H_{18}$) to polycyclic aromatics ($C_{20}H_{18}$).

Oxidation of Lubricants

The oxidation of petroleum lubricants is an autocatalytic reaction, the initial phases of which were investigated by L. L. Davis, B. H. Lincoln, G. D. Byrkit, and W. A. Jones, Continental Oil Company, Ponca City, using an oxygen absorption test. Two types of inhibitors are distinguished: true antioxidants and precipitants. The latter only are effective against metallic accelerators. Oxidation products are proximately separable using solvents and adsorption methods. Ultimate analyses of insolubles and oil-soluble resins stepwise separated from used oil show decreasing oxygen contents. Practical engine tests must finally determine the choice of inhibitors. Such tests emphasise the advantages of certain sulphur-bearing derivatives over simple antioxidants.

Otto Beeck, J. W. Givens, A. E. Smith and E. C. Williams, Shell Development Co., Emeryville, Calif., found that by using the four-ball bearing both for friction and wear studies, wear prevention agents could be segregated into two classes: wedging agents and chemical polishing agents. Wedging agents comprise those long-chain polar compounds which electron diffraction experiments show to be adsorbed on the metal surface to form highly oriented layers with the long carbon chains perpendicular to the surface. Their pres-

ence produces a more rapid transition from boundary lubrication to quasi-hydrodynamic lubrication. Chemical polishing agents increase the load-bearing surface by corroding off the high points which initially carry the load. Their effectiveness is largest when they form compounds which can combine with the surface to form low-melting alloys. Wear reduction factors up to 7 (as compared with white oil) have been found for chemical polishing agents, and wear reduction factors up to 17 for combinations of chemical polishing and wedging agents.

Speaking on "The use of additives in automotive lubricants," F. L. Miller, W. C. Winning, and J. F. Kunc, Standard Oil Development Co., point out that for best performance lubricating oils should have proper volatility, viscosity, stability, oxidation and corrosion resistance, detergency, and lubricating characteristics. In recent years synthetic addition agents have found wide use as means of obtaining these qualities by supplementing conventional lubricating oil refining. Pour-point depressants to lower solidification temperatures, thickeners to improve viscosity-temperature relationships, oiliness agents to aid lubricating properties, antioxidants to increase resistance to oxidation and bearing corrosion, detergents to improve engine cleanliness and reduce sludging, and many other special compounds have been developed and utilised. Modern gasoline and Diesel engines, particularly under heavy-duty operating conditions, have created lubricating problems making these special additives essential for satisfactory performance.

The application of phenolic compounds and metal derivatives thereof as lubricating oil addition agents was the sub-

ject studied by O. M. Reiff, Socony-Vacuum Oil Company. New types of metal organic addition agents for lubricating oils have been developed from alkylated phenolic compounds. By the introduction of alkyl substituents derived from petroleum wax, multifunctional addition agents are formed which are capable of imparting combined properties such as pour-point depressant action, improved V.I. and antioxidant value to lubricating oils. The effectiveness of the multifunctional addition agents is improved by the introduction of metal substituents, particularly in respect to antioxidant value. Attention is directed to the importance of the type of solubilising radical as well as the kind of metal substituent in the formation of metal organic addition agents having antioxidant value.

Discussing petroleum products in industrial and process oils, J. C. Zimmer and E. W. Carlson, Standard Oil Development Co., noted that relatively large quantities of petroleum products are consumed annually in producing lubricating and processing oils in industry, and that these oils not only employ petroleum and its by-products, but also utilise large amounts of special compounding materials. Among these materials are emulsifying agents, fatty oils, extreme pressure agents, inhibitors, etc., which help to adapt the oils to a large variety of individual uses. The industrial oils or machinery lubricants are employed largely for the lubrication of steam engine and gas compressor cylinders, and the bearings of turbines and industrial mills. The process oils, either straight, compounded, or made emulsifiable, are utilised in the metal processing industry as cutting oils and rust preventatives, etc., and also as components of finished goods, such as textiles and ink.

Hydrogenation of Peat Char

Approximation to Sub-bituminous Coals

THE above is the title of a paper, by T. E. Warren, K. W. Bowles, and R. E. Gilmore, all of the Division of Fuels, Bureau of Mines, Canada, which has been published as a reprint from *Fuel in Science and Practice* (1940, 19, 72-6). The experimental method adopted, with a view to subsequent hydrogenation, consisted in heating a sample of 65 gm. of air-dried peat in a steel retort immersed in a lead bath for a period of one hour. The volatile products were collected separately as tar, liquor, hydrogen sulphide, carbon dioxide and other gases. Analyses made of the residual char and of the gas show that by heating at a series of temperatures between 250 and 600° C. peat can be converted to chars which have compositions closely approximating those of a series of coals progressively rising in rank to the medium volatile bituminous group. Although part of the hydrogen in the original peat is removed in the liquor and tar fractions, the oxygen has been eliminated to such an extent as carbon dioxide that the net hydrogen to carbon ratio at the lower temperatures is greater than that of the original peat. Net hydrogen is the hydrogen available for hydrocarbon formation after deducting the equivalent of sulphur, nitrogen, and oxygen from the total.

Comparative hydrogenation tests on the chars, prepared at 300 and 350° C., and on the original peat were carried out in a small, continuously operating plant. The yields from the char proved considerably better than those from the original peat, and were nearly the same as those obtained previously from the sub-bituminous B and C coals, which is consistent with the similarity in elementary composition of these materials.

Moisture is the commonest adulterant in most materials, and methods of determining it have hitherto been both tedious and expensive. Delmhorst Moisture Detectors, which are electrically operated and claimed to be simple, scientific and inexpensive, are described in leaflets issued by their manufacturers, COLLOID EQUIPMENT CO., INC., New York.

Petroleum Toluol for National Defence

(Continued from page 121)

However, it is probable that the total aromatic content of the reformed products is high, perhaps from 30 to 45 per cent., depending on conditions of operation and the nature of the feed materials. If the total aromatic fraction contains 10-20 per cent. of toluol, it would mean that in this process there is a large potential source of toluol capable of early exploitation. Some large cracking units are now in operation in American refineries and others are being built. Another process that is believed to yield large quantities of aromatics, though there has been no published account of it, is the so-called hydroforming process, developed jointly by Standard Oil Development Co., M. W. Kellogg Co. and Standard Oil Co. of Indiana.

At all events, the following announcement by Shell Development Co. indicates that the time is not far off when petroleum toluol will be a reality:

"It has long been known that concentrates containing 60 per cent. toluene are obtainable from selected gasolines, chiefly Borneo gasolines. Such toluene rich gasolines are not available in the U.S. Though TNT can be made from such concentrates, its manufacture is made more complicated by accompanying hydrocarbons; hence such toluene is only a makeshift during an emergency or grave shortage. Shell has now perfected processes for manufacturing from petroleum toluene of exceptional commercial purity passing the most rigid specifications for TNT manufacture. The product from Shell's semi-commercial plant indeed shows greater purity than samples used in many research laboratories in the past for measurement of the physical constants of this compound. Shell is building at Houston, Texas, a plant to produce 2,000,000 gal. per year and is ready further to increase production to 7,000,000 gal. when necessary."

The August issue of "Crossley Chronicles," published by CROSSLEY BROTHERS, LTD., Manchester, contains an article describing two new British motor tugs, 86 ft. twin-screw vessels with 770 b.h.p. Crossley scavenge-pump Diesel engines.

Personal Notes

MISS C. CARDEN has been appointed secretary of the Rubber Industry Export Group in succession to the late Mr. W. F. V. Cox.

MR. J. W. BOYLE, of the Asiatic Petroleum Company and other oil companies in the "Shell" group, has been appointed one of three members of the Enemy Shipping Claims Committee set up by the Board of Trade.

MR. NORMAN SWINDELLS, M.A., Ph.D., of Salford, who is a metallurgist on the staff of I.C.I. at Birmingham, was married last Saturday at Centenary Methodist Church, Dewsbury, to MISS MARJORIE TOLSON, Mayoress of Dewsbury and daughter of the Mayor, Mr. J. E. Tolson.

MR. T. HARRY HEWLETT has been adopted as Conservative candidate for the Exchange Division of Manchester in succession to the late Mr. P. T. Eckersley, who was killed on active service. Mr. Hewlett is chairman and managing director of the Anchor Chemical Co., Clayton, and of Joseph Anderson and Sons, Ltd., Bank Street Chemical Works.

OBITUARY

VISCOUNT HORNE, who died last week, was President of the National Sulphuric Acid Association, Ltd., and Chairman of the Imperial Smelting Corporation, Ltd.

New Control Orders

Alcohol Propylene exempt from K.I.D.

BY the Safeguarding of Industries (Exemption) No. 12 Order, 1940, dated August 22, 1940, alcohol propylene has been exempted from Key Industry Duty.

The exemption becomes operative in respect of goods of the above description which are entered with the Customs, or delivered from bonded warehouse, on or after August 29, 1940, and remains in force until December 31, 1940.

Imported goods exempted from Key Industry Duty under this Order become liable to duty under the Import Duties Act, 1932. The words "Exempt from Key Industry Duty under Treasury Order" are to be inserted in the Customs entry for goods in respect of which exemption is claimed under this Order.

Use of Formaldehyde

The Minister of Supply has issued the Control of Molasses and Industrial Alcohol (No. 10) Order which comes into force on October 1. The new Order extends the provisions of the No. 8 Order to formaldehyde. In consequence a licence will be required by anyone wishing to buy, sell, treat, use or consume more than 40 gallons of formaldehyde in any one calendar month. Any inquiries should be addressed to the Molasses and Industrial Alcohol Control, Great Burgh, Epsom, Surrey.

DRYING PAINTS WITH INFRA-RED LIGHT

Interesting experiments on the possibility of drying paint or other similar films with infra-red light have been made in the United States by J. Bennett and Howard Hayes. With suitable regulation of the radiations used, they claim that drying, which in normal circumstances would require several hours or even several days, can be carried out in four or five minutes. The experiments indicate that the most successful effect is obtained with radiations of a length of about 20,000 Å, which means a filament temperature of approximately 1500° C. It is possible, however, to use ordinary incandescent lamps with a temperature of the filament of approximately 2600° C. to 3200° C. A concave gilded mirror is used as a reflector. Speed of drying varies with the nature of the objects and their capacity to absorb or radiate heat. Colour of the film to be dried will also affect speed of drying, as will the nature of the paint. Synthetic resin paints have been found to be the easiest to dry in this way.

British Chemical Prices

Market Reports

THERE are no changes of any importance to record for general chemicals this week, and business so far as heavy chemicals are concerned is of a routine character. Makers' deliveries against contracts are reported satisfactory, and in some directions an improvement in the supply position to meet export orders is noted. Values in all directions are firm at recent quotations. Conditions in the market of coal tar products remains moderately active, and the price position steady. The market has no important feature, although pyridine is reported to be easier.

MANCHESTER.—Apart from some slight easiness in one or two of the tar products firm price conditions still obtain in virtually all sections of the Manchester chemical market. The soda compounds are being taken up in fair quantities and a steady demand persists for permanganate of potash and most other potash products; most of which are in short supply. The heavy acids are being taken out in good quantities. Among by-products naphthalenes, pyridines, and cresylic acids are not too strong, but the light products are well held and in steady demand.

GLASGOW.—In the Scottish heavy chemical trade business goes on as usual with practically no delays occurring with our connections in the capital. Orders are still up to full expectations and prices remain firm. No change is anticipated.

Price Changes

Naphthalene.—MANCHESTER: Refined, £26 per ton.
Pyridine.—MANCHESTER: 16s. 6d. to 20s. per gal.

A Chemist's Bookshelf

CHEMISTRY, LIFE AND CIVILISATION. By Hubert T. S. Britton, D.Sc., D.I.C., F.I.C. London: Chapman & Hall. Pp. 266. 5s.

Perhaps, strictly speaking, this book should be on every bookshelf rather than the chemist's; but any chemist who is anxious to further the knowledge and appreciation among non-chemists of his branch of science, could do worse than present a copy of the volume to each of his inquiring friends. The present volume is a cheaper edition of Professor Britton's original work, which appeared in 1931; but it is generous in addition, for a supplement dealing with some aspect of chemical progress since that date has been appended. It is a pity that both the body of the work and the supplement give evidence of hasty editing; misprints are far too frequent. Sometimes, too, the style is a little too pedestrian even for the non-technical reader towards whom the book is directed.

CHEMICAL PUBLICATIONS, 2nd Ed. By M. G. Mellon, Ph.D. London: McGraw-Hill. Pp. 284. 18s.

Since Dr. Mellon first produced this guide to "the literature" in 1928, the mass of chemical information that has appeared in print has been of greater relative volume than in any preceding period. A second edition of his work is therefore especially pertinent. The chapter entitled "Making Searches in the Chemical Literature," which includes the use and construction of indexes, is particularly information, and, incidentally, gives an indication of the amount of work that may be involved as the result of an apparently simple inquiry. The whole book, in fact, though naturally compiled from the American standpoint, is of great use to abstractors, scientific librarians, and the like; its purpose is mainly indirect, from the point of view of the industrial chemist.

FOR REASONS OF CENSORSHIP, envelopes with gummed address labels, or envelopes reconditioned for use in any way by means of gummed paper, may not be used for letters sent: (1) from Great Britain to Northern Ireland or *vice versa*; (2) from Great Britain or Northern Ireland to Eire, or to certain countries abroad—in general, to all non-Empire destinations (other than Egypt and Iraq) in Europe, Asia and Africa, and non-Empire European dependencies in America.

General News

KERN OIL TOTAL PRODUCTION during August amounted to 218,961 barrels, or approximately 31,280 tons.

WILLIAM BLYTHE AND CO., LTD., chemical manufacturers, of Church, Lanes., have given a £50,000 free-of-interest loan to the Chancellor of the Exchequer for the duration of the war.

THE MINISTER OF AIRCRAFT PRODUCTION has acknowledged a £20,000 gift from the staff of Lever Brothers and Unilever, Ltd., and their associated companies, for the purchase of a bomber.

BORAX CONSOLIDATED, LTD., has removed its offices from Regis House, King William Street, E.C.4, to Daneshill, Oxshott, Surrey. All communications should now be addressed there.

THREE MEN WERE INJURED in an explosion which occurred last week at a Glasgow steelworks, and one was detained in hospital. The explosion, it is believed, was caused by a pocket of water inside a quantity of metal which the men were smelting.

DR. J. H. QUASTEL, F.R.S., Director of Research, Cardiff City Mental Hospital and Honorary Lecturer in Bio-chemistry in University College, Cardiff, has kindly consented to give a lecture before the Institute of Chemistry on "The Chemistry of Enzyme Action" in October. Further particulars will be announced by the Institute in due course.

PRICE STUTFIELD AND CO., LTD., of 110 Fenchurch Street, London, E.C.3, for many years representatives of Carbonisation et Charbons Actifs of Paris (owners of the "Acticarbhone" Patents and Processes) announce that they have been given a licence by the Trading with the Enemy Branch (Treasury and Board of Trade) to continue all the activities of "Acticarbhone" in the United Kingdom and British Empire. This licence includes the use of all the "Acticarbhone" patents and processes. Facilities are available for the completion of all plants in construction and the study of all problems of Solvent Recovery with the provision of plants made entirely in this country.

THE WAGES OF MORE THAN 3000 workers in the Scottish tube manufacturing industry are to be increased as from the first pay week in September. The increases will be 3s. a week for men of 21 years of age and over; 1s. 6d. a week for youths over 18 and under 21; and 1s. for boys under 18. The advance is the result of a conference between members of the Scottish Tube Makers' Wages Association and representatives of the National Union of General and Municipal Workers, the Transport and General Workers' Union, and the Iron and Steel Trades' Confederation. The districts to benefit include Glasgow, Airdrie, Coatbridge, and Rutherglen. This is the third advance since the war started.

THE FAMOUS ROMAN DEEP GOLD MINE at Pumpsaint, Carmarthenshire, which has been worked at various times since the beginning of the Christian era, the last occasion being some three years ago, has now been acquired by George Cohen, Sons & Co., Ltd., the well-known machinery merchants of London, Stanningley, etc. They are now offering for sale the modern machinery which was installed there in 1937, with the exception of certain plant that has been reserved against possible requirements of Government departments. This comprises, among other items, four 109 kw. Diesel alternator sets; two 500 cu. ft. air compressors; processing machinery, including a McLean spiral classifier; a 10-compartment Denver flotation plant; a Dorr thickener and Dorr-Oliver disc filter, etc.; quarrying plant, and piping, cable, buildings, etc.

Foreign News

ARGENTINE EXPORTS OF CASEIN to the end of May, 1940, totalled 6205 tons, of which 1282 tons came to the U.K., the U.S.A. taking 2618 tons. Output of casein in Argentina, up to the end of April was 7204 tons.

AN AUTHORISATION exempting from taxes for five years the Compañía Industrial Los Reyes, S.A., of Mexico, for the manufacture of fused caustic soda is published in the Mexican *Diario Oficial*. The company is likewise authorised to import annually, free of duty, 5000 kg. of sodium nitrate and sufficient sheet steel to make 8200 drums.

From Week to Week

A RECENTLY DISCOVERED NICKEL DEPOSIT in Arizona is described as the largest nickel concentration in the United States, and one of the largest in North America.

CHILEAN EXPORTS OF IODINE to the end of March, 1940, were valued at 3,000,000 pesos as against 2,900,000 pesos during the same period of 1939. (1 peso = 6d.).

THE GOVERNMENT OF INDIA has exempted from Customs duty all goods imported by them for the use of the Defence Services.

THE WAR SUPPLY BOARD of the Government of India has given its sanction to the construction of a Government plant for making tropical and super-tropical bleaching powder.

EXPORTS OF PHOSPHATE ROCK from the Island of Makatea, in French Oceania, increased from 112,950 long tons in 1934 to 160,680 tons last year, thanks mainly to the growing demand of the Japanese market. Part of the rock went to Sweden.

INDIA IS TO BUY quinine worth eighty-five lakhs of rupees from Java, according to the Madras radio (quoted by Reuters). The purchase will be made in the form of 300,000 lb. of quinine sulphate and of another 50,000 lb. of quinine in bark.

SHAWINIGAN CHEMICALS, LTD., a subsidiary of the Shawinigan Water and Power Co., Ltd., of Canada, and the Gurney Foundry Co., Ltd., have jointly formed a subsidiary company, Electric Steels, Ltd., to operate a Government factory in course of erection in the province of Quebec.

IMPORTS OF AMMONIUM SULPHATE into the United States in the first half of 1940 were 31,798 long tons, as compared with 54,698 tons in the corresponding period of 1939. Of this total nearly 96 per cent. was of Canadian origin. No ammonium sulphate has been imported from the U.K. since 1936. Of the 64,801 long tons of ammonium sulphate exported from the U.S.A. in the same period, an important item is the figure of 36,761 tons shipped to Japan, after a period of three blank years.

IMPORTS OF PAINTS AND VARNISHES into Canada in June were valued at \$461,000, against \$404,000 in June, 1939. Of the total, the United States accounted for \$315,000 and the United Kingdom for \$137,000. Imports of vegetable oils were valued at \$958,000, compared with \$805,000 in June, 1939. The United States contributed approximately half of the month's total imports. The chief products imported were coconut oil, cottonseed oil, olive oil, groundnut oil, and palm and palm kernel oils.

AN EXPORT TAX of two per cent. *ad valorem* has been placed on all exports from Peru of gold, vanadium, tungsten, molybdenum, manganese, tin and petroleum, and a similar tax of one per cent. on exports of all other minerals and petroleum derivatives. Funds obtained from this source will go to provide the capital for a new bank, the Banco Minero del Peru, already established with an authorised capital of 50,000,000 soles, wholly owned by the Government. The initial working capital will be provided by Government borrowing from the Central Bank or from commercial banks. The bank will finance companies established in Peru, provided that sixty per cent. of their capital is held by Peruvians. Primary consideration will be given to mining companies.

WELDING PROGRESS

The latest welding development announced by Barimar, Ltd., is a new process for welding together ferrous and non-ferrous metals such as steel and aluminium. The process, which is complex, must not be confused with any form of brazing or soldering, as it is a genuine weld, that is to say, there is fusive union of such strength that the breaking point at the junction is not less than that of the weaker metal, as in the case of a weld joining two pieces of the same metal. The success of this development is dependent upon a new form of flux, unusual methods of manipulation, and extremely accurate flame control. The new process is already being used by Barimar, Ltd., for work of a highly important nature.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfactions

J. J. RIGBY, LTD. (old company), Manchester, soap manufacturers, etc. (M.S., 14/9/40.) Satisfaction September 2, debentures registered March 22, 1935, and March 4, 1936, satisfied by payment of £2,155 6s. 2d.

County Court Judgments

CELTIS, LTD., R/O Bridge Road, Welwyn Garden City, chemical manufacturer. (C.C.J., 14/9/40.) £21 17s. 4d. July 25.

Receiverships

PHOENIX PROPRIETARIES, LTD., London, N.W.5, manufacturing chemists. (R., 14/9/40.) C. W. Adkin, C.A., 83 Kingsway, W.C.2, was appointed receiver on September 3.

Company News

International Bitumen Emulsions, Ltd., have declared an interim dividend of 4 per cent. for the year.

The British Thermostat Co., Ltd., manufacturers of scientific instruments and general engineers, is maintaining the ordinary interim at 7½ per cent., less tax. Last year there was a final of 11 per cent.

The United Indigo and Chemical Co., Ltd., announces a profit for the year to June 30, of £9323, compared with £4368 in the previous year. The directors recommend an ordinary dividend of 5 per cent. and further dividends of 1½ per cent. on the ordinary and the 5 per cent. preference shares, all less tax.

Directors of the Turkey Red Co., Ltd., have decided not to pay the dividend on the four per cent. first, or 5½ per cent. second cumulative preference shares for the half-year to June 30. The first preference dividend is in arrears from January 1, 1938, and the second from January 1, 1934.

Cooper, McDougall and Robertson, Ltd., announce that in view of present conditions they have decided not to pay an interim dividend on the ordinary shares on September 30. The half-yearly dividend on the 7 per cent. cumulative preference shares of the company will be paid as usual on September 30.

The British Aluminium Co., Ltd., is paying an interim dividend of 3 per cent. actual, less tax, payable October 1 (last year 4 per cent.). The directors have also declared a dividend at the rate of 6 per cent. per annum, less tax, on the 6 per cent. cumulative preference stock for the six months ended June 30, payable October 1.

Boots Pure Drug Co., Ltd., announces a dividend of 6 per cent., less tax, on the ordinary shares for the quarter ending September 30. This is a regular quarterly payment. For the last financial year to March 31 last, four dividends of 6 per cent. were paid, together with a bonus of 4.1379d., less tax. Payment will be made on September 30 to shareholders on record on September 10.

Oxley Engineering Co., Ltd., announces a net trading profit for year to June 30, 1940, of £39,872 (last year, £26,655). Provision for income-tax, etc., leaves a net profit of £15,674 (£16,544). Directors recommend dividend of 10 per cent. per annum (12½ per cent.). Balance to carry forward, £7631 (£5471). Meeting, Leeds, September 20, at 2.30 p.m.

New Companies Registered

Gordon Chemical Co., Ltd. (363,100). Private company. Capital, £500 in 500 ordinary shares of £1 each. To carry on business as oil blenders, manufacturers, blenders and distillers of and dealers in oils, lubricants, greases, drysalts, manufacturers of and dealers in chemicals, etc. Directors: Raymond G. Kennedy; Harold E. Lockyear. Registered office: 183 Oxford Road, Manchester, 13.

Hants Chemical Co., Ltd. (362,825).—Private company. Capital, £1000 in 950 8 per cent. cumulative preference shares of £1 each and 1000 ordinary shares of 1s. each. Manufacturers of and dealers in chemicals, gases, drugs, medicines, gypsum, plasters, disinfectants, fertilisers, salts, acids, foodstuffs, oils, isinglass, colours, glues, gums, pigments, varnishes, compositions, dyes, etc. Directors: Henry T. Durant, Arthur R. Canning, Richard C. Griffith. Registered office: 2 Broad Street Place, E.C.2.

Bryan and Walker, Ltd. (362,725).—Private company. Capital £500 in 500 shares of £1 each. To acquire the business carried on by W. S. Bryan at Harts Lane, Barking, as Bryan and Walker, and to carry on the business of chemical manufacturers, merchants and exporters of coal tar products and derivatives, bitumen and bituminous compositions, etc. Directors: William S. Bryan, 48 Aldersey Gardens, Barking; Elizabeth S. Bryan, Albert H. J. Tiley. Registered office: Harts Lane, Barking, Essex.

Chemical and Allied Stocks and Shares

BEARING in mind the intensification of aerial warfare, the stock and share markets have shown a remarkably firm undertone. At the beginning of the week prices of industrial and other securities were marked down as a precautionary measure, but it soon became apparent no heavy liquidation was likely to develop. In fact, in some cases shares of companies connected with the chemical and kindred industries are slightly higher on balance, although in many instances, quotations have not been adequately tested by business during the past few days.

Compared with a week ago, Imperial Chemical were higher, and are 26s. at the time of writing, there being widespread hopes that the interim payment may be maintained at 3 per cent. On the other hand, the company's 7 per cent. preference units made the slightly lower price of 28s., at which they appear to offer an attractive yield, bearing in mind the excellent cover for their dividend requirements. B. Laporte remained firmly held and were inactive, although business was recorded recently at 49s. Lever and Unilever at 20s. 3d. were little changed, while the 8 per cent. preference were 22s. 3d. As in many other instances, United Molasses have not held best prices touched recently, but at 19s. were little changed on balance, while the ordinary units of the Distillers' Company were around 56s. Various shares of companies identified with building and construction work tended to have a steadier appearance; Associated Cement were 52s. 6d. and British Plaster Board 5s. units remained around 9s., while Pinchin Johnson were higher at 19s. and International Paint remained around 65s. Goodlass Wall and Lead Industries ordinary shares were inclined to improve. Imperial Smelting were firmer at 7s. 9d. awaiting the announcement in regard to the dividend on the preference shares. Borax Consolidated were also firmer at 25s. 7½d. and Barry & Staines remained around 23s., but in accordance with the general tendency on the Stock Exchange, few dealings have been recorded.

Dunlop Rubber at 28s. 9d. lost part of the strong rise shown at the end of last week, while British Oxygen were 60s. and British Aluminium 36s. 3d. Triplex Glass 10s. units were fairly steady around 18s. awaiting the forthcoming dividend announcement. Greeff-Chemicals 5s. units continued to be quoted around par; the interim dividend falls to be declared shortly. British Match ordinary units held most of their recent improvement, and Wall Paper Manufacturers' deferred units were 15s. 7½d. Results of the last-named company, which on this occasion will cover eleven months, are expected to be issued in October. In other directions, William Blythe 3s. ordinary shares were around 5s. 3d.; announcement of the interim dividend is due shortly. At Birmingham Southalls (Birmingham) 5s. units kept around 24s. 6d. This highly-successful company is reducing its interim payment from 10 per cent. to 7½ per cent., tax free, but this is payable on the enlarged capital resulting from last year's 100 per cent. scrip bonus.

Movements in Dorman Long, Stewarts and Lloyds, United Steel and Tube Investments have been small and unimportant at the time of writing. Similar remarks apply to Calico Printers and most other textile shares, although Courtauld's ordinary and British Celanese preference shares lost part of last week's improvement. Elsewhere, Boots Drug were relatively steady, and Beechams Pills deferred shares remained firm, awaiting the interim dividend announcement. Business in British Drug Houses took place around 21s. Fison Packard were inactive; and Lawes Chemical continued to be quoted at 7s. 6d. pending publication of the financial results. There was no very definite tendency among oil shares; "Shell" were rather firmer, but Burnah Oil were inclined to ease in advance of the interim dividend decision.

NEW SAFETY GLASS

A new safety glass which leaves no splinters and provides a remarkable adherence between the laminations, has been developed by the I. G. Farbenindustrie, Germany. It consists of two thin sheets of glass held together by a central sheet of plastic material. The plastic is prepared by polymerisation of 16 molecules of vinyl acetate and one molecule of dimethyl maleate, which is then saponified by acetalisation with butyraldehyde. To 100 parts of the resultant substance are added 66 parts of the isohexylic ether salt of diglycolic acid, and the whole is plasticised with 11 parts of methoxybutanol. This is then heated to 80° C. and thoroughly mixed together, after which it can be rolled into a sheet, which is then pressed between two thin sheets of ordinary glass, and heated to 120° C. The whole is finally cooled under pressure. Adherence between the glass and the plastic is said to be very remarkable.

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CLASSIFIED SECTION

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